

nervous system, apparently having its seat in the medulla oblongata, stands in a reflex connection with the sensory cerebro-spinal fibres. *f.* Various poisons, especially digitalis and strychnia, increase and strengthen the heart's beat, after division of the vagus, by increasing the irritability and activity of this cerebro-spinal cardiac nervous system.—*British Med. Journ.* of Feb. 1863, from *Berlin Med. Centralzeitung*, and *Wiener Med. Wochenschrift*, Dec. 20, 1862.

2. *Physiological Anatomy of the Lungs.*—Dr. NEWTON HEALE read before the Royal Medical and Chirurgical Society a paper on this subject.

The following points in connection with the physiological anatomy of the lungs have been elicited as the result of investigations made by the author:—

First. As regards the pleura.

Certain longitudinal channels are to be found in it. These are pervious to air, and are connected with the minutest air-passages in the substance of the lungs by means of tubular passages in the subpleural cellular tissue. They are surrounded by a vascular plexus, derived from the pulmonary system of blood-vessels.

Second. As relates to the manner in which the air is distributed throughout the lungs.

A remarkable difference is to be noticed in what is ordinarily called the bifurcation of the trachea as it exists in the human subject contrasted with that of other mammalia. In the latter a large trunk is given off from the windpipe before it reaches the spot which is usually called its bifurcation. This trunk goes to the upper part of the right lung. The left bronchus is therefore, in those animals, the second alternate branch which proceeds from the main air-pipe. Each bronchial tube, instead of splitting up equally into lesser tubes, and thereby forming a dichotomous or a trichotomous division, passes towards the margins of the lobes in a continuous direction, though diminishing in size. It gives off its branches in an alternate manner, and each of the subordinate tubes pursues a similar course. When they have arrived at a certain degree of diminution, a set of membranous tubes, differing in some respects from the bronchial tubes, and also from the air-cells, but being intermediate in character between the two, are sent off from the terminal bronchial tubes. To these membranous tubes the author attaches the name of pedicles. The true pulmonary tissue is quite distinct in its anatomical peculiarities from those of the bronchial tubes, however small these may be. It does not at all resemble them, and they cannot be mistaken the one for the other. The ultimate parenchyma of the lungs is made up of little bodies, to which the author attaches the name of "leaflets." The pedicles connect the terminal bronchial tubes with the leaflets; and many pedicles from different terminal tubes enter into each leaflet. This peculiarity in the leaflets causes a very minute anastomosis to take place between the different bronchial tubes, which could not occur if the ordinary description were correct.

Third. The author does not profess to have contributed any fresh facts relating to the lymphatics or to the nerves as to their purely anatomical characters.

Fourth. With reference to the characters and functions of the so-called bronchial arteries.

The author prefers to give the name of sustentary arteries and veins to the bloodvessels usually denominated bronchial. He considers that the latter word implies that they have some peculiar relation to the bronchial tubes, and more especially to the bronchial membrane, which is a destination usually attributed to them. They have in consequence been supposed to be the vessels peculiarly engaged in the pathological condition known as bronchitis. The author's investigations show that every sort of vascular action throughout every part of the lungs, by which any damage to its tissue is remedied, is accomplished through the sustentary vessels exclusively, although the peculiar plexus by which the whole of the mucous surface is covered, and by which the bronchial mucus is supplied, is not in any degree contributed by the so-called bronchial arteries. Physiologically and anatomically, the sustentary and pulmonary systems are quite distinct. While the duty of repairing the tissue of every part of the lungs devolves upon the sustentary vessels, that of bringing the venous blood

furnished by the right side of the heart into contact with the air, and of accomplishing the physiological purposes which are aimed at by that arrangement, is intrusted solely to the pulmonary vessels. The purpose for which the vascular plexus is spread out in the mucous membrane is entirely connected with the atmospheric influences, and the large surfaces which that membrane affords for the furtherance of that object is thus turned to account, and the plexus itself is consequently in exclusive relation with the pulmonary system of bloodvessels. Modern authors, with the exception of Dr. Harrison, of Dublin, concur in believing that there is some kind of anastomosis between the minute branches of the pulmonary and sustinent vessels. That gentleman with great truthfulness and candour, acknowledges that he has not been able to satisfy himself that the presumed anastomosis has not been the result of the rupture of one or both sets of vessels in the act of injecting them.

The author of this paper has found that the *vasa vasorum* of the pulmonary vessels are supplied entirely by the sustinent arteries; and that when the latter have been fully distended, and some degree of violence has afterwards been used, the minute capillaries in connection with the sustinent arteries which are spread over the interior of the walls of the larger pulmonary vessels have sometimes been made to burst, and a false communication into the canal of one of the pulmonary vessels has thus been made. A channel for the injection having been once established by an accident of this nature, it becomes gradually enlarged in proportion as the injection is afterwards made to flow through the rent, and an unlimited quantity of injection may then be made to flow through the artificial passage. The pulmonary and sustinent vessels cannot be made to communicate with one another by any other means than this.

It has been a disputed point as to whether the so-called bronchial arteries are furnished with veins. It is, however, easily shown that sustinent veins accompany the bronchial tubes, returning the residual blood supplied by the sustinent arteries to the internal parts of the lungs; and that other sustinent veins ramify in the subpleural tissue, which collect the blood from the exterior of those organs.

Attention is called to the fact that the sustinent veins are furnished with valves, and with cross branches of anastomosis. These last facts are of some importance, not with regard to the lungs only, but also with reference to the bloodvessels, which discharge in other viscera a function similar to that of the sustinent arteries.

#### Fifth. As relates to the distribution of the pulmonary vessels.

Modern authors describe the *pulmonary arteries* as accompanying the bronchial tubes; as continuing to divide again and again, becoming more numerous than the tubes; as giving off branches of supply to the various tissues; as anastomosing with the so-called bronchial arteries; and their residue as being ultimately distributed to the air-cells. The author considers this account to be far from accurate. He finds that the pulmonary arteries never give off branches of supply to *any* tissue. They never form any anastomosis either among themselves or with any other bloodvessel. They do not become more numerous than the bronchial tubes, since each of these is accompanied by one, and never more than one, pulmonary artery, which pursues in relation to it a perfectly definite and invariable course; and the final distribution of every portion of the pulmonary artery, down to the minutest fragment, is precisely and entirely alike. The whole of it is split up so as to form the remarkable anastomosing plexus in the leaflets. The pulmonary *veins* commence in the interior of the leaflets by *tufts* of capillaries. The veins formed from these commencements are placed, in the first instance, at some distance from the bronchial tubes; but as they increase in size they come into contact with them. A remarkably vascular plexus, composed exclusively of pulmonary vessels, occupies the whole surface of the mucous membrane. This is derived as an offshoot from the plexus in the leaflets, and is reinforced in the larger tubes by bloodvessels furnished from the leaflets which cling to the tubes externally, and send perforating branches to the plexus in the membrane. Some *ramusculi* are also placed externally to the tubes. They collect the blood from the plexus in the membrane, and convey it to the larger pulmonary veins, the formation of which has

been described above. There are, therefore, in the first instance, two distinct sets of minute pulmonary veins. One of these, after leaving the leaflets, makes its way at once in a direction towards the left auricle, without undergoing any further exposure to the air. The other is spread over the mucous membrane, and derives the benefit of the atmospheric influence which the surface of that membrane affords, and ultimately joins the other portion. The anatomical distribution of the pulmonary vessels indisputably proves that their physiological function is exclusively in relation with the air supplied by the bronchial tubes, and that it is totally independent of any purpose having relation to the construction or repair of any part of the *tissue* of the lungs.

(The paper was accompanied by numerous drawings and diagrams.)

Dr. Heale, at the request of the President, drew attention to the apparatus which he employed. He showed that in injecting the pulmonary arteries and veins with different colours both should be injected simultaneously, so that the two fluids should meet in the capillaries. If the arteries by themselves were injected first, the fluid passing through the capillaries into the larger vessels beyond would prevent the proper injection afterwards of the veins, and *vice versa*. He showed that no anastomosis existed between the so-called bronchial vessels and those of the pulmonary system, as the capillaries of the first could be injected in every part of the lungs without any of the injection reaching any of the other vessels. In speaking of the distribution of the air to the tissue of the lungs, he mentioned that a very free anastomosis was established between the air contained in different parts of the lungs after the bronchial tubes had reached their minutest subdivision. Dr. Heale gives the name of pedicles to the smallest of the bronchial tubes, and that of leaflets to the ultimate subdivisions of the pulmonary tissue. He showed that there was a complex inoculation between different leaflets and pedicles. The equal diffusion of air throughout the lungs is further provided for by tubular passages which ramify in the subpleural and interlobular cellular tissue, and communicate with longitudinal channels in the substance of the pleura. Passing to the physiological points involved in the various anatomical details, he remarked that it was usual to speak of respiration as one thing, of circulation as another, and of nutrition as a third; but that in point of fact all three were parts of one and the same physiological operation, and that it was as impossible that the circulation or the nutrition should go on independently of the respiratory processes as that the hands of a watch should continue to point the hour when the mainspring was impeded in its action. Dr. Heale then explained at some length his views with regard to the heart's action in effecting the circulation of the blood, the physiology of respiration, &c.

In answer to a question from Dr. Lec, Mr. Heale stated that he had been engaged during the last two years in dissecting the ganglia and nerves of the lungs, and that in these dissections a great system of ganglia and nerves was displayed throughout the lungs; and he considered that without taking into account these nervous structures of the lungs the functions of those organs could not be explained.—*Med. Times and Gaz.*, May 30, 1863.

3. *Fetus born without Heart, Brain, Lungs, or Liver.*—Dr. Wm. H. DICKINSON read before the Royal Medical and Chirurgical Society (May 12th, 1863) a description of a monster of this kind.

This being, like all others of the same character, was a twin. Both umbilical cords were attached to a single elongated placenta. The imperfect fetus was devoid of any vestige of head or neck. The upper extremities were present, but were in some respects imperfect. On the anterior surface was a small prominence, which appeared to represent the tip of the tongue. The umbilical cord was surrounded at its foetal extremity by a small membranous bag, which contained a coil of intestine. The lower extremities were only slightly different from their usual state. The body was generally swollen and oedematous. The spinal column was deficient from the second cervical vertebra upwards. No trace of any cranial bones could be discovered. The clavicles were absent. The integuments were of unusual thickness, owing to a general infiltration of serous fluid. In the cavity of the trunk lay the lower two feet of the intestine,